



Multiannual Programme of the Joint Research Centre 1980-1983

1982 Annual Status Report

Provision of scientific and technical services

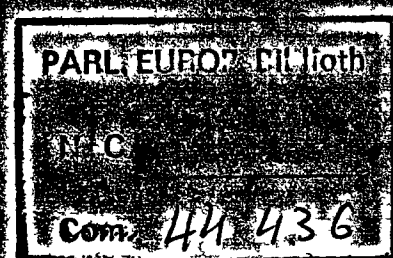
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PROVISION OF SCIENTIFIC AND TECHNICAL SERVICES

1982

Research Staff: 26
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Projects:
 — Technical Evaluations
 — Technical Assistance

Programme Manager:

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1. INTRODUCTION

Two kinds of objectives are pursued at the JRC in direct support of the various General Directorates of the Commission: Technical Evaluations where system analysis techniques are mainly employed and Technical Assistance where laboratory measurements, technical expertises and management of projects are provided.

Technical Evaluations

One of the tasks of the services of the European Communities is to study the Community's policy in various sectors, to forecast developments or to indicate targets. This is especially true for the industrial, scientific and technological policy, for the energy policy and for the policy on the resources and the environment. In these fields it is desirable to have some tools available for the analysis, to enable the Commission to get the right overview of the necessary information. System analysis is a helpful approach for the purpose, including techniques such as computer modelling and data handling, system optimization and simulation, cost benefit studies and technical assessments. The multidisciplinary competences available and the specific competence in treating data enables the JRC to execute this kind of research in various fields.

The JRC therefore acts for the Commission as a source of technical advice, taking active part in setting up and running an information network. The work for this project is done upon specific request of the various services of the Commission. The detailed programme for each action is established yearly by an Advisory Committee of General Directorates representatives which makes a choice of the various needs and sets up priorities. Although the field of possible applications of system analysis techniques is large, three outstanding important aspects, which fit particularly well with the competences of the JRC, should be mentioned:

- Resources (e.g. model of regional development, studies on agricultural production patterns, raw material problems).
- Energy (e.g. analysis of the energy system, evaluation of technological progress, studies on energy conservation)
- Environment (e.g. collecting and updating information concerning ecological models, providing scenarios of the geographical distribution of pollutants emission).

Technical Assistance

An important and expanding activity of the JRC consists in providing the Commission with technical and scientific assistance and analysing technical problems required e.g. by

the implementation of new regulations, by evaluating research proposals, by collaborating in the technical management of contracts, by comparing and synthesizing results etc. These activities may involve collaboration with a number of national laboratories as well. On the other hand, the requirements of independency and secrecy which often are needed for the execution of the work, can be best satisfied in a laboratory operated by the Commission like the JRC. The activity is splitted into two main parts: the first dealing with laboratory analyses and development of experimental techniques and the second concerning the technical assistance to project management and the provision with scientific advices.

2. RESULTS

TECHNICAL EVALUATIONS

In 1982 the activity for the project «Technical Evaluations» was mainly concentrated in the energy field, covering chapters on «Energy savings», «Nuclear energy strategy studies», «Analysis of the energy system». In addition some work was also carried out on «Special transport problems», on the «Utilization of local resources in Developing Countries», on some «Assessments on pollution problems» and on studies of the «Perception of technological risk».

Energy savings

Energy Bus Programme

The «European Data Service for Energy Savings» was established at the JRC Ispra, following the adoption of the European Energy Bus Programme by some of the Member States.

This service was set up to aid those participants who are in the pre-operational fase of their respective energy bus programme and to link all the energy savings programmes in such a way that each country benefits from them as a whole.

The major support to any energy bus programme is a computer program system developed in Canada for Canadian Energy Bus Programme and already adapted to European standards and needs.

The activity on the European Energy Bus Programme was made up of four tasks, of which three have now been carried out and the necessary infrastructure set up as well:

- The adaptation of Canadian energy bus software to European conditions.
- The establishment of a computer program library, including the exchange of newly developed energy bus software.
- The development of a data base which serves as a support to the analysis of energy use and energy saving data.

The fourth task, the analysis of the data which is still continuing, will be the basis of the future development of the programme.

Industrial Processes

In the framework of energy savings in industries, analyses of mainly two industrial processes have been carried out:

- Industrial boilers: the operation condition in relation to new developments in the field of coal combustion technology.
- Heat-exchangers: optimization of the heat transfer between two fluids.

Nuclear energy strategy studies

On request of the EURATOM Supply Agency, the Joint Research Centre has developed a Data Bank for collecting and managing administrative and numerical data concerning particular commercial transactions on nuclear fuels involving EC countries. The Bank is operated through the Data Management System ADABAS and is provisionally installed on the AM-DAHL computer of the Ispra Establishment. The Bank is of an experimental nature since it does not cover all the possible fuel movements in the EC; however an extension could be provided in future to go in this direction. The Bank which is still in a test phase, will become operational during the year 1983.

Analysis of the energy system

Under this heading two studies have been conducted, the technical analysis of the energy system in the household sector and the contribution to the EC Energy Model.

The study on the household sector started in 1980. In performing this study collection of many statistical information on building characteristics, on their distribution, their occupancy behaviour, the structure of ownership, their costs and on climatic conditions was needed; an evaluation of the adequacy of such information was made with the purpose of giving an indication of the areas in which more need for statistical data exists.

A considerable amount of work has been devoted to extend the data set in order to introduce available data on European building stocks. Data for Belgium, Denmark and Holland have been collected and guidelines have been developed for the analysis of detailed data available for a region (Liguria).

Analyses of meteorological data available for Italy have also been performed.

The technical aspects of heat losses and gains through windows have been studied in detail. In particularly, the study on the heat gains achievable with the use of reflecting roller blinds has been extended.

The contribution to the EC Energy Model is aiming at creating at the JRC a competence for the implementation and diffusion of such model developed through contractual action by DG XII and at providing support for its validation, improvement and use. The activity was focussed on the use of the long term European energy model MEDEE3. The experience gained in this model has lead to the collaboration with ENEA, which provides the informations concerning the basic structure of the energy demand in Italy as well as the initial conditions.

Transport

In addition to a small study carried out on a possible development of the seaborne transportation of spent nuclear reactor fuels, by a special new type of ship, the following studies have been carried out:

Shipbuilding Data Bank

The activities concerning the Shipbuilding Data Bank consisted of improvements and changes in response to the requirements. This Data Bank contains information subdivided into three main groups viz. total orderbook and ships under construction, new orders, as well as ships delivered and placed in service during consecutive years and throughout the world. The available information is presented according to different criteria, such as the type of the ship (oiltankers, bulk carriers or general cargo ships), the latter with a more specified classification according to its cargo and miscellaneous ships as well as the country of build and flag of registration.

The main parameter of the information supplied regarding the three main groups is the «compensated gross tonnage». This tonnage is obtained by multiplying the gross register tons attributed to each ship by special coefficients, depending on the type and size of the considered ship. The values of these coefficients were determined by OECD and are accepted at international level.

Since a new IMCO (IMO) Convention concerning the calculation of the gross register tonnage came into force in July 1983, with the consequence that the basic parameters (grt) for ships still to be build ships are changed, some major modifications of the computer program used for the Data Bank were necessary and have been introduced.

Under contract with the Commission, Lloyd's Register at London is providing regularly data, which are reproduced for use of the Commission services.

A direct data transmission from Lloyd's Register (London) to Ispra (via Euronet) is under consideration.

The transmission of the quarterly processed data from Ispra to Brussels, using the JRC databank connection to the Diane-Euronet network is depending on the availability of an appropriate service terminal in Brussels. It is foreseen that this terminal will be available in 1983.

Magnetically levitated transport systems

There is a growing interest of governments in the new high speed transportation concept (non contact levitated and guided transport), which could advantageously compete with the European airlines, at least on its most important routes.

In many countries, extensive research on and development of magnetic suspension and of linear electric motors have been conducted during the last twenty years.

Two important projects in Germany and Japan are about to enter the experimental phase.

The amount of human and financial effort invested in these programmes has been considerable, and will be even greater in the future.

In order to implement a status report on research and development of non contact levitated and guided transport systems on

behalf of G.D. VII, bibliographic data and information was gathered and persons were contacted for consultation.

Utilization of local resources in developing Countries

The JRC contributes with technical expertises, mainly in the energy field, to the support of Developing Countries provided by the European Commission.

Special emphasis is given to Appropriate Technology for Less Developed Countries and to problems in relation to the efforts of WHO-Headquarters for «Health to All by the Year 2000» and the «Drinking Water Decade».

A definition of Appropriate Technologies for Less Developed Countries which takes into account the most substantial achievable technical independency of the local producer and the user was worked out. Proposals for certain development tasks (like special stoves, solar mini-pumps, slow windmotors, etc.) were worked out.

Perception of Technological Risk

Social opposition to technologies is not new, however the reasons for it have differed from case to case, reflecting a complex constellation of concerns related to morals, religion, political ideology, power, economics, psychological well-being and physical safety.

In the framework of the project «Forecasting and Assessment in the field of Science and Technology», so called FAST, the JRC is providing assistance to the special unit of the Commissions Services in charge to pursue this project.

The support is given both the assisting in the evaluation of work performed under indirect action as well as by undertaking own studies in certain key areas as the risk assessment, the mapping of technical, social, economical and psychological boundaries to the acceptance of new technologies, and the identification of subjectivities in technical and economic analyses.

The main activities of the FAST team have been the synthesis of their work and the preparation of a comprehensive report of their first five years of activity.

Accordingly the JRC effort has also been directed toward completing work in progress and the issue of four publications.

Assessment on pollution problems

Aircraft Noise Nuisance

An aircraft noise nuisance computer program is under development to study actual noise contours at and around airports in the E.C. and to study the impact of possible noise reduction measures.

The program originally computed noise according to the nominal flight track (the path the aircraft should follow according to the flight instructions for the pilot). In practice however, aircrafts tend to deviate from this path horizontally in such a way that a bundle of actual flight paths is formed (flight track dispersion), whilst vertical changes are caused by instructions from traffic control (A.T.C. traffic control override).

In order to take into account the effect of such flight track

deviations upon the noise nuisance computed by the program, algorithms for the computation of flight track dispersion values and of the traffic control override were developed under contract and were integrated in the original version of the program.

Another feature implemented in the program is the possibility to compare the noise generated by different types of aircrafts, by computing footprints of any single aircraft type, (take off, landing or combined) according to the 5 internationally existing computation methods.

Work was also made in the adaptation of a Track Utility program developed under contract. This program «translates» the S.I.D. (Standard Instrument Departures) instructions for the aircrew, into flight track coordinates and is used as input for the main program.

Occupational Safety and Health

Within the diffusion of the most recent knowledge about health and safety in the work-place, the C.E.C. (D.G.V. Health and Safety Directorate-Lux) is publishing a monographical series that, on the basis of about 40 reports, describes the techniques of Biological Monitoring of professionally exposed workers in three chief categories of industrial tossics: metals, solvents and pesticides.

An editorial board, into which the JRC Ispra is participating, is coordinating the bringing up to date and the critical review of the monographs, of which a first group concerning exposures to: Benzene, Toluene, Chlorinated Hydrocarbons, Inorganic Lead, Cadmium, Manganese and Titanium, has most been published.

The Pathway of Cadmium

A study on the evolution of the human intake of cadmium with food in the E.C. has been terminated. For this study an extension of the existing simulation model for the pathway of cadmium in the E.C. was made to the compartments «Agricultural Soils» and «Oceans» in order to determine the contribution of agricultural food (cereals, vegetables, fruits, meat and poultry) and fish to the daily intake of cadmium by man. An external report dealing with the possible future evolution of the average environmental cadmium concentrations in the E.C. and their effects on the human intake of cadmium is in press.

2. Technical Assistance

2.1 Laboratory analysis

In addition to the JRC contribution as project leader to the COST-action 61 a bis on the physico-chemical behaviour of atmospheric pollutants and as EC expert to the COST-action 64 b bis on the analysis of organic micro pollutants in aquatic systems, the following activities have been subject of study:

Diary products

On request of the General Directorate for Agriculture, work is

in course for the critical evaluation and the improvement of the spectrophotometric procedures for the selective determination of the whey content of milk-powder and buttermilk. A simple analytical method had to be found to be used as screening method, which has a relative high accuracy and reproducibility and which does not introduce adulterations.

The free sialic acid content can be considered as a useful tracer to detect whey in the milk powders due to the suitable relationship between the content of sialic acid and total proteins.

Different types of milk powders have already been successfully analysed by determining the free sialic content. However, if this method is applied to buttermilk samples, reproducible results are only found if clear solutions are obtained during the flowsheet of separation of the glycomacropetides and after the addition of trichloroacetic acid. A simple modification of the analytical method could enable the application also for buttermilk samples. Supplementary analytical work with well established types of buttermilk is however necessary in order to verify the accuracy and reproducibility of the application.

Up to now 40 samples of milk and buttermilk sent by DGVI have been analyzed.

Fertilizers and Surfactants

Within the framework of the participation of the JRC as EC Laboratory, in the interlaboratory exercises, a number of analytical procedures for the determination of various components of different types of fertilizers were tested or improved. These determinations were particularly dealing with the ammoniacal nitrogen content of and the oil retention in some ammonium nitrate fertilizers. The results were examined during the meetings of the working groups of the International Standard Organization in which the JRC contributes as EC expert.

Chemical problems related to surfactants have been subject of other meetings in Brussels in which the JRC participated as expert. In particular the future Community Directive for ionic surfactants was examined.

Wine

In support of the General Directorate for Agriculture two subjects are in study:

- determination of certain heavy metal contents of wine, which could be dangerous for human health.

The determinations of the Cd, Cu, Pb and Zn content have been carried out directly by potentiometric stripping analysis, without destroying the organic matter by any previous chemical treatment. This analytical technique permits the determination of these heavy metals contents even under the limits recently proposed by the Member States.

- research of a possible analytical method for the detection of fraudulent additions of Saccharose to wine in order to increase its alcohol content.

Up to now, no simple and proved analytical method have been found to be routinely applied to samples of wine of unknown origin. With the classical analytical methods, only relative large contents of sugar can be detected. Research is underway to improve the determination of the radio of

some heavy isotopes by mass spectrometry by which additions of synthetic alcohol, of cane sugar and of beet sugar can be detected if the origin of the wine is known.

Trace metals in biological fluids

Analytical work has been performed within the frame of the second campaign on the biological screening of the population in the EC, in which the JRC acts as a community reference laboratory and which consisted of the determination of the lead content of blood samples by using different analysing techniques. Other analytical work consisted of the determination of traces of Aluminium in serum, blood and tap water by electrothermal atomization.

Radioprotection

This activity forms part of an investigation on a larger scale of the man-made contribution to the different trace element concentrations of aquatic ecosystems along the Italian coast, in particular of existing and future nuclear sites. Several sediment samples have been collected from the Ligurian sea between Sestri Levante and Viareggio and the Tyrrhenian sea in front of Garigliano's nuclear power plant.

The 250 μm fraction of the collected sediments has been analysed for the elements, Cu, Ni, Co, Cr, Mn, Sr, Zn, Al and Co after total dissolution, and in addition to this the leaching behaviour of these elements was determined. The results are giving the knowledge about the geochemistry of the sediments in the various coastal zones, as well as the information about the degree of contamination of the sediments by pollutants discharged by man or by natural phenomena.

Cost-Action 68 ter

The use of sewage sludge in agriculture and in connection to this, the accumulation of micropollutants in soil and their unavoidable enrichment in the food chain, led to research activities on pathways, accumulation factors, uptake mechanisms and toxicity of two groups of micropollutants: toxic trace elements and organic trace components.

Starting point of this research is the identification of a set of reliable test methodologies for the determination of the different pollutants concentrations in both sewage sludge and the members of the food chain - soil and crop materials, and the organization and evaluation of interlaboratory exercises.

The use of reference materials to select the best analytical procedures is considered to be very useful to overcome difficulties related to the detection of low pollutant concentrations. To this end, on request by the COST management the JRC contributed in preparing reference materials which consisted of homogeneous and stable sewage sludge and soil samples.

The major effort was centered on the problems of polychlorinated biphenyls (PCB's) which enter the agricultural foodchain mainly through the application of sewage sludge on agricultural land and on the analytical errors associated with the determination of plant-available heavy metals in sewage sludge amended soils.

2.2 Scientific/Technical Advices

Support to the Custom Union Service

Scientific expertise has regularly been given to the Committee for Customs Franchise, which is dealing with the complaints of importers of instruments from non-Community Countries. The scientific nature of the instruments manufactured outside the Community and subsequently imported, have to be compared with similar types of instruments manufactured by firms inside the EC for which the opinion from specialists of the JRC in Ispra, is requested.

An other specific activity was the technical assistance given to the Legal Service in the frame of the Commission's decision against the duty-free importation of computers in the EC.

Support to demonstration Projects in the field of Energy Savings

A contribution was given to the analysis of about 50 proposals for demonstration projects in the field of energy conservation. These proposals are the first lot of the 4th call for tender from G.D. XVII and concerned mainly the field of: Buildings, Heat pumps, Combined heat-electricity production, Industry, Waste recycling and transport.

Olive tree register

Assistance was given to G.D. VI during the reporting period, for the implementation in Italy of the olive tree register technique, formerly developed at the JRC.

3. CONCLUSIONS

Explicit motivation for this programme is providing support to the Commission services in various fields where the JRC has competence. By doing this, the JRC contributes with its technical and scientific work to a better accomplishment of the tasks of the Commission services in a number of sectoral policies.

The project Technical Evaluations corresponds to two types of work: general system studies, computer modelling and technical assessments. The activities in this project were mainly concentrated on problems concerning the energy sector, which requires thorough analysis in preparation of any decision making. In particular, the modelling of the energy system and the contributions of nuclear energy were dealt with.

Energy saving problems were also analyzed. This work is closely connected with the Commissions indirect research action and with the actions of the Commission services responsible for energy and for industry and includes a collaboration with a number of national institutes in the Member Countries active in this field.

Besides the activity on special transport systems and on the Shipbuilding Data Bank which is aiming at providing the competent Commission Services regularly relevant information on shipbuilding, another activity concerns the study of the utilization of local resources in developing countries which is performed under request of and in tight connection with the com-

petent General Directorate of the Commission and the local authorities of the interested countries.

Finally, the studies on the protection of the environment, complementing the specific research programme existing at the JRC, provide a direct technical support for the preparation of some recommendations and directives produced by the competent Commission service; in addition, a scientific contribution was given to the FAST project which aims to exploring the long term future of the scientific and technical evolution of our society.

The second project of the programme, Technical Assistance, consisted of specific experimental work on, among others, fertilizers, dairy products, wine, trace metals in biological fluids and on the aquatic environment. The scope of it is to develop or to select reliable analytical determination methods and to let them be accepted as standard method on a large international scale.

Another part of this project is dealing with technical consultations, such as the contribution to the Commissions services for the qualification of scientific instruments produced outside the Community for a duty free import, to demonstration projects in the field of energy savings and to the implementation in Italy of the olive tree register technique.

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